Tensile, barrier, dynamic mechanical, and biodegradation properties of cassava/sugar palm fiber reinforced cassava starch hybrid composites

ABSTRACT

The hybrid composite was prepared from cassava bagasse (CB) and sugar palm fiber (SPF) by casting technique using cassava starch (CS) as a matrix and fructose as a plasticizer. The chemical composition and physical properties of SPF and CB were studied in this work. SPF was added at different loadings of 2, 4, 6, and 8% dry starch to the CS/CB composite films with 6% CB. The addition of SPF influenced the hybrid properties. It was observed that the addition of 6% SPF to the composite film increased the tensile strength and modulus up to 20.7 and 1114.6 MPa, respectively. Also, dynamic-mechanical properties of the hybrid composites were investigated using a DMA test. The incorporation of SPF increased the storage modulus (E') value from 0.457 GPa of CS to 1.490 GPa of CS-CB/SPF8 hybrid composite film. Moreover, the incorporation of SPF slightly decreased the water vapor permeability (WVP) compared to the CS/CB composites film. It can be concluded that the incorporation of SPF led to changes in cassava starch composite film properties, potentially improving the bio-degradability, WVP, and mechanical properties of the film. Based on its excellent properties, CB/SPF-CS hybrid composite films are suitable for various purposes such as packaging, automotive, and agro-industrial applications, at lower cost.

Keyword: Cassava film; Hybrid composite; Cassava bagasse; Sugar palm fiber; Physical properties; Thermal properties